

REMARKS

Claims 1-8, 10-17, and 21 are all the claims pending in the application. Claim 9 has been cancelled, above, and claims 1-8, 11-15, 17, and 21 stand rejected on prior art grounds. Claims 10 and 16 stand objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants respectfully traverse the rejections based on the following discussion.

I. The Prior Art Rejections

Claims 1, 5-6, 9, and 21 stand rejected under 35 U.S.C. §102(b) as being anticipated by Winniczek, et al. (U.S. Patent No. 6,228,278), hereinafter referred to as Winniczek. Claims 2-3, and 7 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Winniczek. Claims 4, 8, 11-15, and 17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Winniczek, in view of Hopkins, et al. ("Plasma Diagnostics in Industry," Plasma Physics Control, Fusion 42, 2000, B189-B197), hereinafter referred to as Hopkins. Applicants respectfully traverse these rejections based on the following discussion.

The claimed invention provides a method comprising providing an input signal to a chamber and detecting whether an abnormal plasma discharge exists in the chamber by detecting an abrupt change in impedance. In the rejection, the Office Action argues that Winniczek discloses that a self-induced bias on a substrate can change due to an increased current leakage between the plasma and the substrate. However, the "*current*

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leakage" in Winniczek is not analogous to the "abnormal plasma discharge" of the claimed invention. In addition, nothing within Winniczek discloses providing an input signal into a chamber to monitor impedance of the chamber. Therefore, as explained in greater detail below, Applicants respectfully submit that the prior art of record does not teach or suggest the claimed invention.

The Office Action argues that Winniczek discloses that the self-induced bias on the substrate can change due to the increased current leakage between the plasma and the substrate (Office Action, p. 2, para. 5, 2nd sentence – p. 3, para. 1, 1st sentence). In support for this argument, the Office Action cites column 3, lines 50-60 of Winniczek, which the Office Action argues discloses that as a target layer is etched through, the capacitive and resistive coupling between the substrate and the plasma changes. As one possible explanation, the self-induced bias on the substrate may change due to the increased *current leakage* between the plasma and the substrate as the etch features (such as vias or trenches) are etched down to a stop layer. It is also possible that the properties of the plasma itself are changed as the target layer is etched through. This change brings about a change in the plasma impedance, which in turn changes the self-induced bias on the substrate.

However, the "*current leakage*" in Winniczek is not analogous to the "abnormal plasma discharge" of the claimed invention. As defined in independent claims 1 and 21, the claimed invention comprises "detecting whether an abnormal plasma discharge exists". Moreover, as defined in independent claim 11, the claimed invention comprises "detecting whether plasma leakage exists".

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Unlike the claimed invention, however, Winniczek does not teach monitoring the plasma state. More specifically, Winniczek teaches monitoring the *currents* flowing into the electrostatic chuck as a way of endpointing an etch process. These currents change not primarily due to a change in the plasma, but primarily due to a change in the surface of the wafer — hence their value as an endpointing tool. Winniczek does not use this method of monitoring currents to monitor the plasma state (including abnormal discharge of the plasma). This is because the method of Winniczek is primarily sensitive to the state of the surface of the wafer, not the plasma.

Although it is possible that a significant alteration in the plasma impedance may change these currents, it is also possible that a change in plasma impedance may not affect the currents. Moreover, these currents may be altered without a change in the plasma impedance. An example of a significant change in the plasma impedance that would not alter the measurements of Winniczek is where the plasma expands past a containment plate but keeps its density constant; the plasma in the region of the wafer is unchanged, making Winniczek's measurements unchanged. The measurement of total plasma impedance would not decrease. An example of significant change in the current measurements with no change in the plasma state is where an insulating layer is being thinned by an etch. As the insulator is thinned, the currents measured by Winniczek increase even if the plasma is held constant.

Therefore, contrary to the position taken in the Office Action, Applicants submit that the "*current leakage*" in Winniczek is not analogous to the "abnormal plasma discharge" of the claimed invention. Thus, it is Applicants' position that Winniczek does

not teach the claimed feature of “detecting whether an abnormal plasma discharge exists”, as defined in independent claims 1 and 21; or “detecting whether plasma leakage exists”, as defined in independent claim 11.

In addition, the Office Action argues that Winniczek discloses providing an input signal into a chamber (Office Action, p. 3, para. 1, 2nd sentence). In support for its argument, the Office Action cites column 5, lines 48-60 and 63 of Winniczek, which discloses a system and method of monitoring currents. More specifically, current monitor circuits 234 and 236 are provided, wherein the potential difference across each may be ascertained to determine the current flowing to each of poles 208 and 210. The outputs of current monitor circuits 234 and 236 are input into a comparator circuit 238. Comparator circuit 238 outputs a control signal 240 for controlling a variable bias compensation power supply 242, which changes its output responsive to control signal 240. The output of bias compensation power supply 242 is employed to bias main power supply 224 to keep the currents flowing to poles 208 and 210 substantially equal in magnitude and opposite in sign.

Thus, Winniczek teaches a system and method of monitoring currents. However, nothing within Winniczek, including the portions cited by the Office Action, discloses providing an input signal into a chamber to monitor impedance of the chamber. Accordingly, it is Applicants' position that Winniczek does not disclose the claimed feature of “providing an input signal to said chamber ... [and] monitoring impedance of said chamber”, as defined by independent claims 1 and 21; or “providing an input signal

to said chamber ... [and] monitoring impedance ... to determine the voltage of said chamber", as defined by independent claim 11.

Therefore, it is Applicants' position that Winniczek does not teach or suggest many features defined by independent claims 1, 10, 11, 16, and 21 and that such claims are patentable over the prior art of record. Further, it is Applicants' position that dependent claims 2-8, 12-15, and 17 are similarly patentable, not only because of their dependency from a patentable independent claims, but also because of the additional features of the invention they defined. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

II. Formal Matters and Conclusion

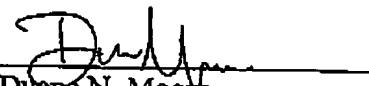
With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims.

In view of the foregoing, Applicants submit that claims 1-8, 10-17, and 21, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 09-0456.

Respectfully submitted,

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